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# Hydrogen Production from Biomass by Heat of Fusion

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**Abstract**: In this research, a new hydrogen production method based on the heat from fusion energy and biomass is proposed. In order for hydrogen energy to make significant contribution to the global environmental problem and to substitute fossil energy-resources, technologies of large scale production are required. Hydrogen production process requires raw material and energy, and in the future both must be free from carbon dioxide emission, while current technology consumes fossil resources for these. Biomass is another possible hydrocarbon source for hydrogen, but regarded as carbon-neutral. Biomass resources can be obtained in both rural and urban areas as waste for small cost. For production energy, Renewables such as photovoltaic and wind could be used as clean sources for hydrogen, but only water electrolysis is known. The use of heat, particularly from nuclear energy, is more efficient than electrolysis. From the standpoint of effective use of biomass, I is more efficient to decompose the biomass rather than direct combustion and to use as resources because chemical energy of biomass is transferred to hydrogen and not wasted.. Endothermic reaction of biomass to generate hydrogen with nuclear energy is thus expected for future hydrogen. The objective of the present study is to investigate the feasibility of this biomass based high temperature hydrogen production process. Biomass, typically represented as cellulose, is decomposed with the steam at temperature above 800 deg C, into hydrogen and carbon monoxide: (C6H10O5)n + mH2O -> aH2 + bCO + cCO2 ...Previous studies revealed this reaction can proceed at lower temperature, but by-product, such as tar, is reduced with increasing reaction temperature, which results in high hydrogen production efficiency. Fusion reactor provides the steam having temperature above 900 deg C and one can expect high hydrogen production efficiency. In this study, the fundamental characteristics of the reaction of hydrogen production process in the temperature range above 900 deg C is experimentally measured. As the results of the experiments, preliminary feasibility evaluation is expected to be made for the hydrogen production process by nuclear heat from biomass. At the same time, system analysis and design of fusion power plant for material recycle in developing countries is being performed based on the engineering data obtained in this study. Such a study will suggest some possible options for developing countries to establish an environmentally sound energy system while avoiding compromise on economical development.